

# Transport and Mixing in the Summer Subtropical UT/LS

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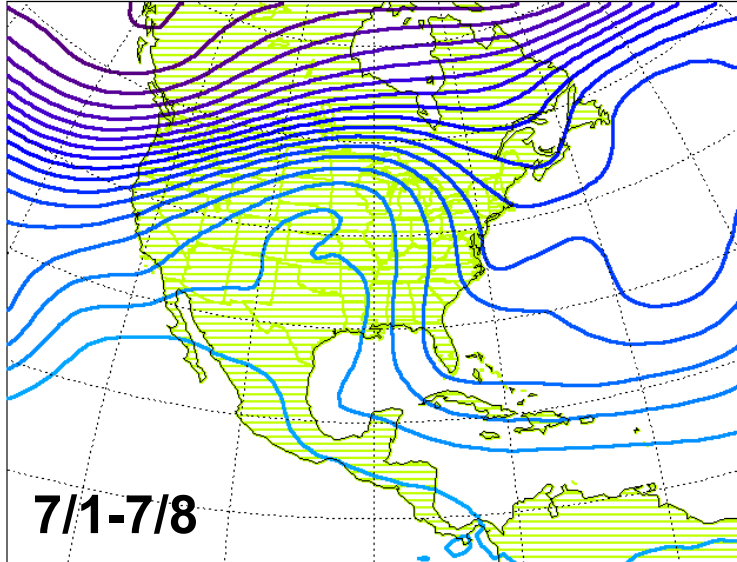
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# Outline

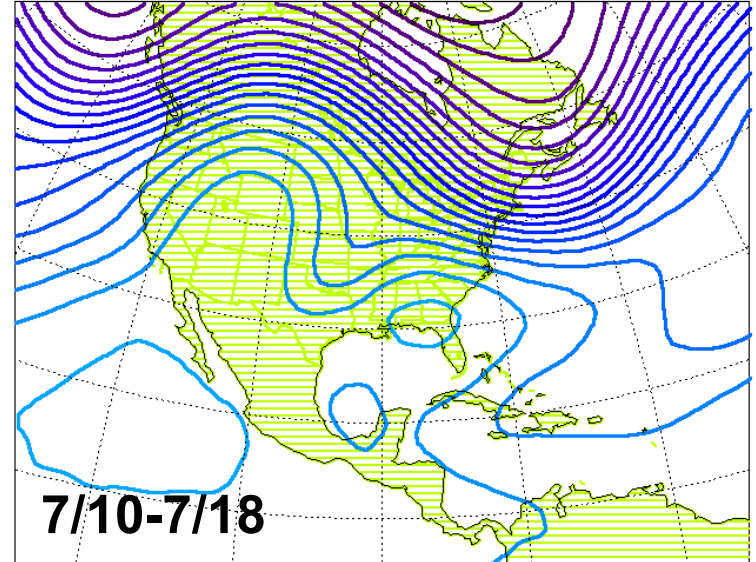
- Brief overview of large-scale UT/LS meteorology.
- Midlatitude convection and subsequent isentropic mixing in the lower stratosphere.
- Very preliminary mixing results...

# NCEP Geopotential Height 150 hPa

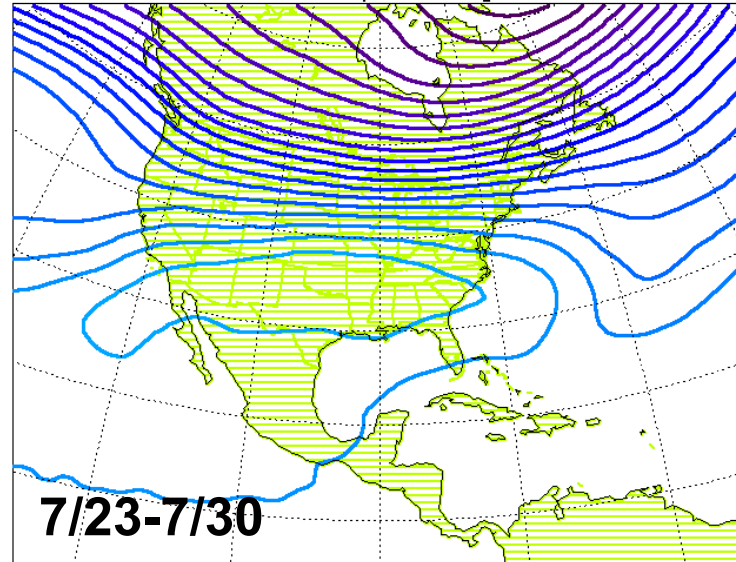
NCEP 2002070100-070800 Geopotential Height on Press = 150 hPa



NCEP 2002071000-071800 Geopotential Height on Press = 150 hPa

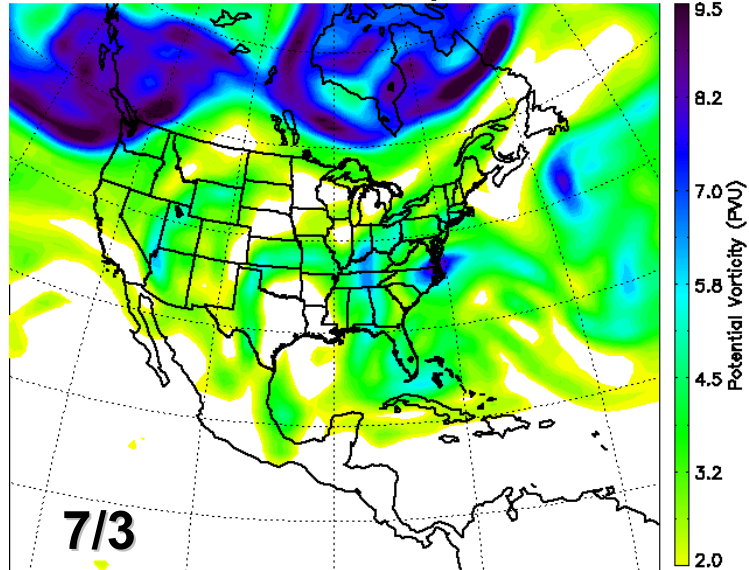


NCEP 2002072300-073100 Geopotential Height on Press = 150 hPa

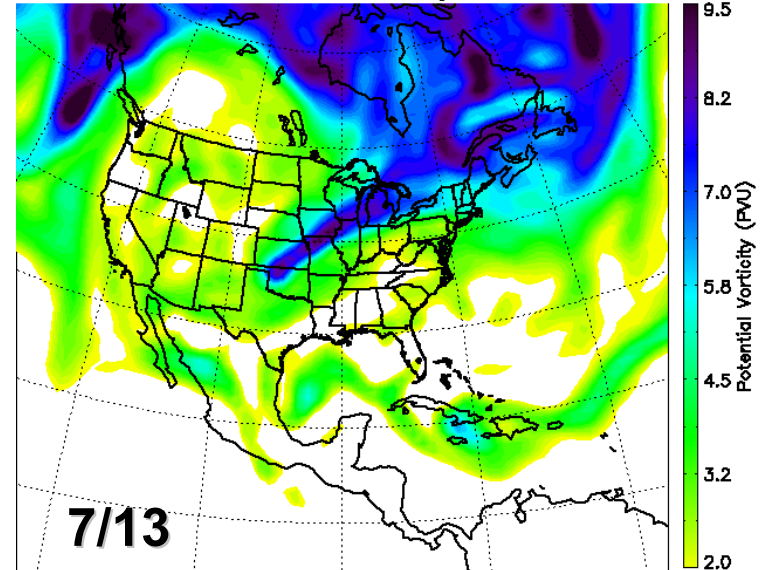


# NCEP Potential Vorticity 355 K

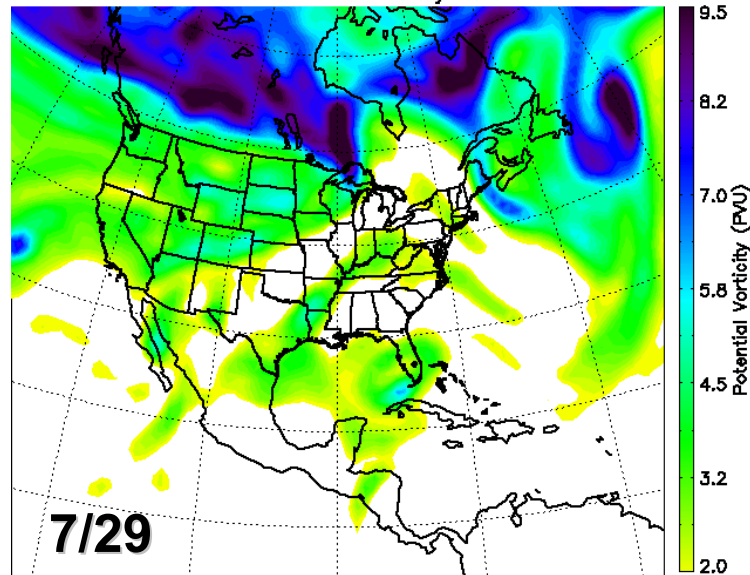
NCEP 2002070318 Potential Vorticity on Theta = 355 K



NCEP 2002071318 Potential Vorticity on Theta = 355 K

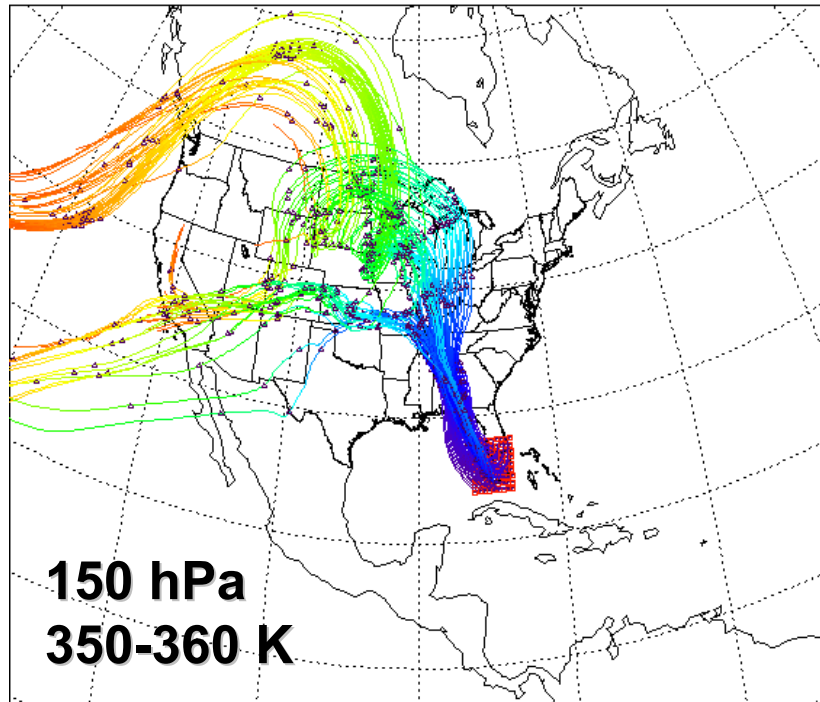


NCEP 2002072918 Potential Vorticity on Theta = 355 K

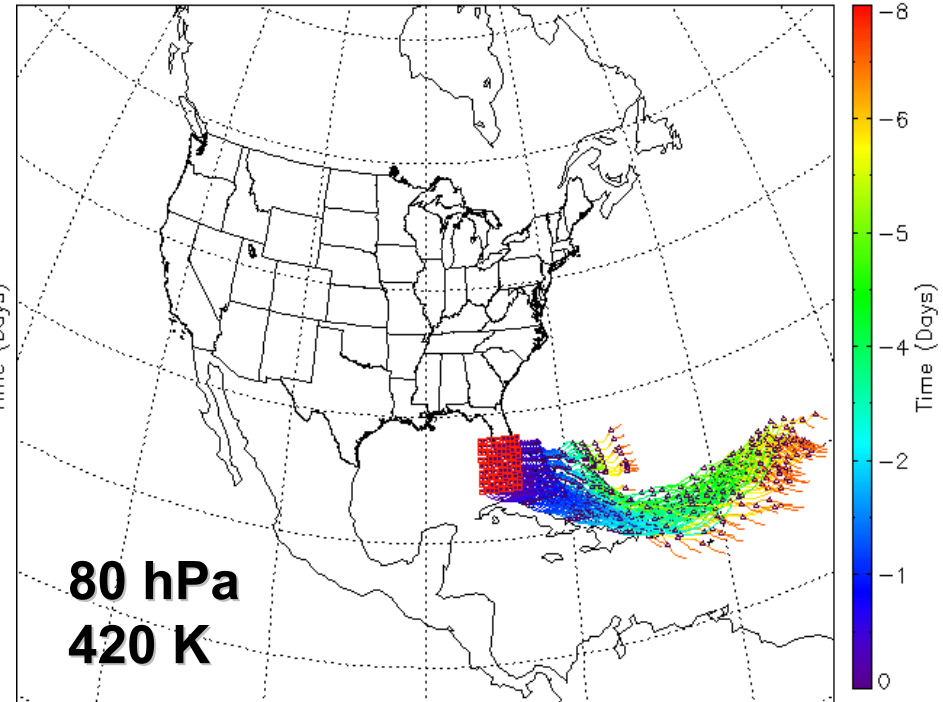


# Back Trajectories July 3

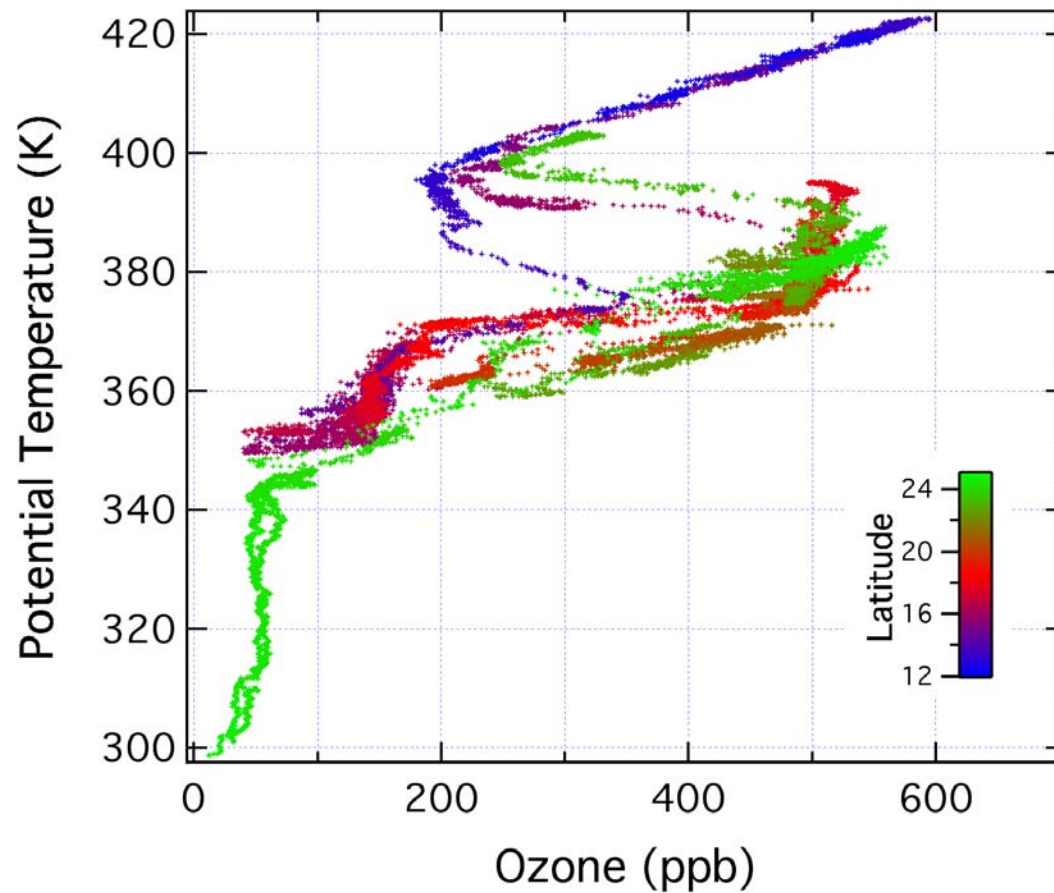
CRYSTAL-FACE 20020703 150 hPa



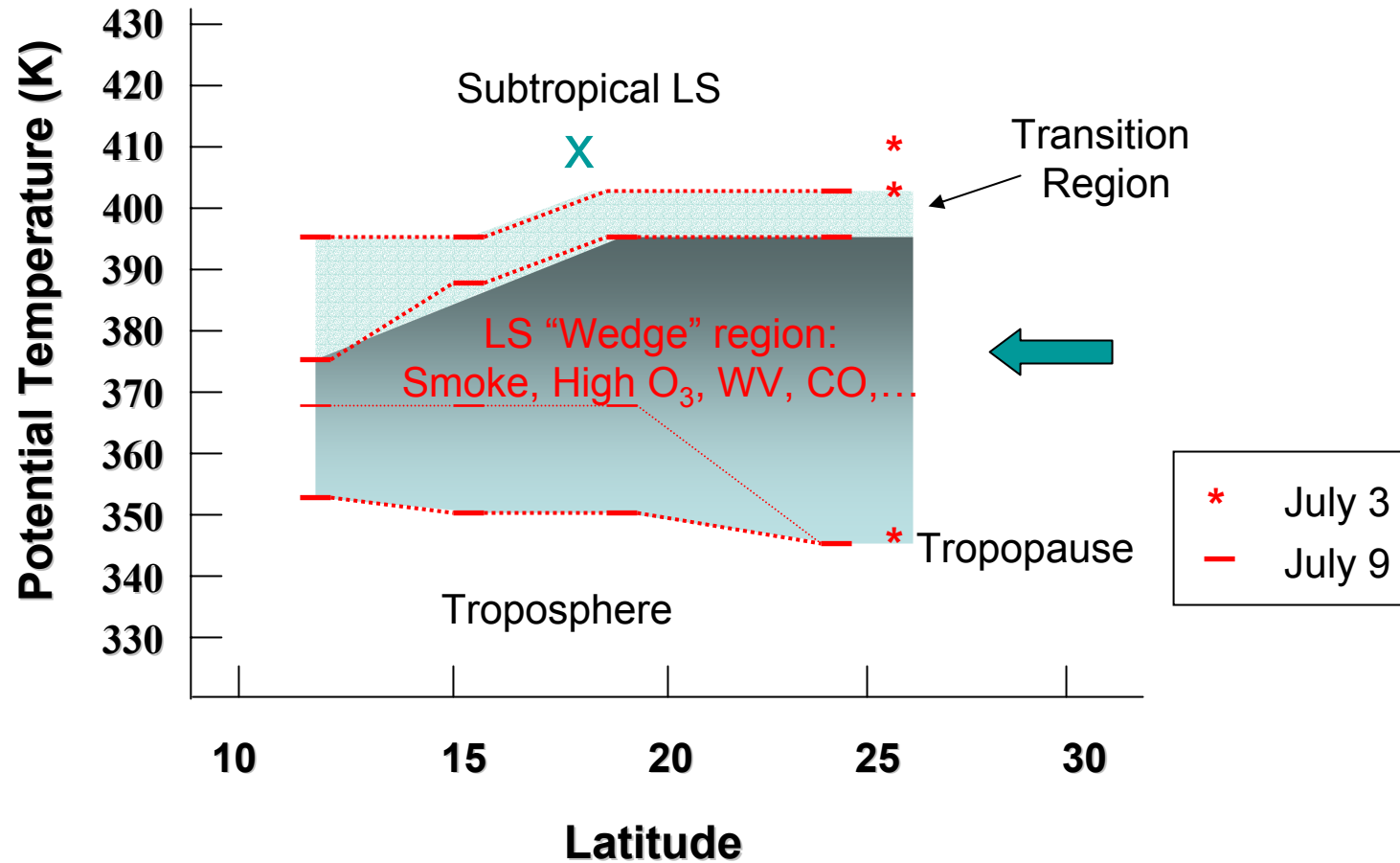
CRYSTAL-FACE 20020703 80 hPa



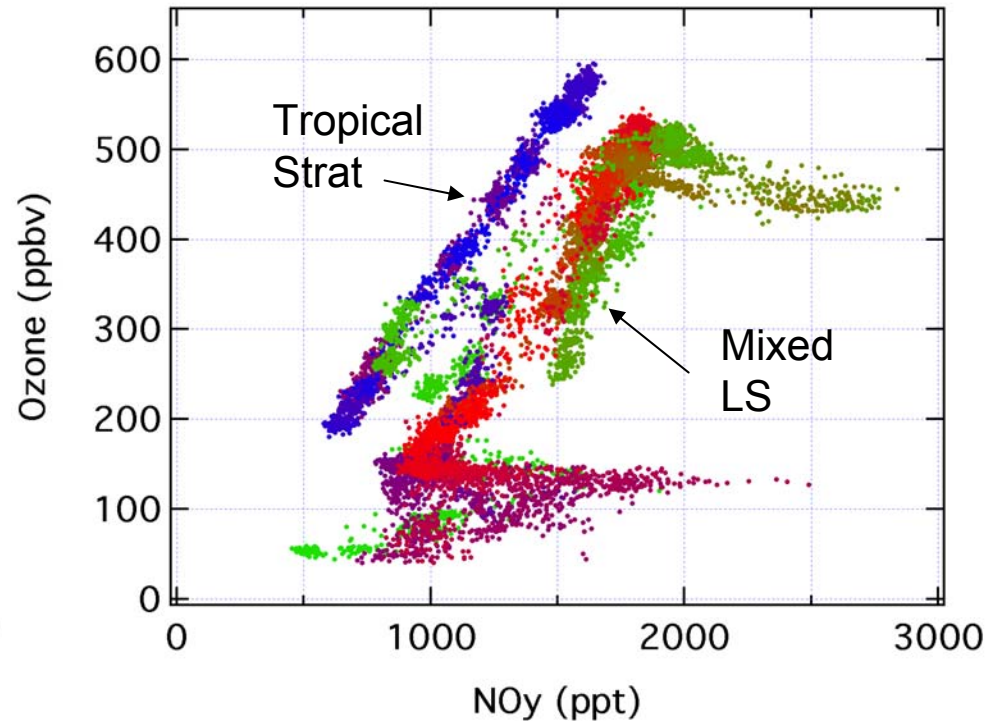
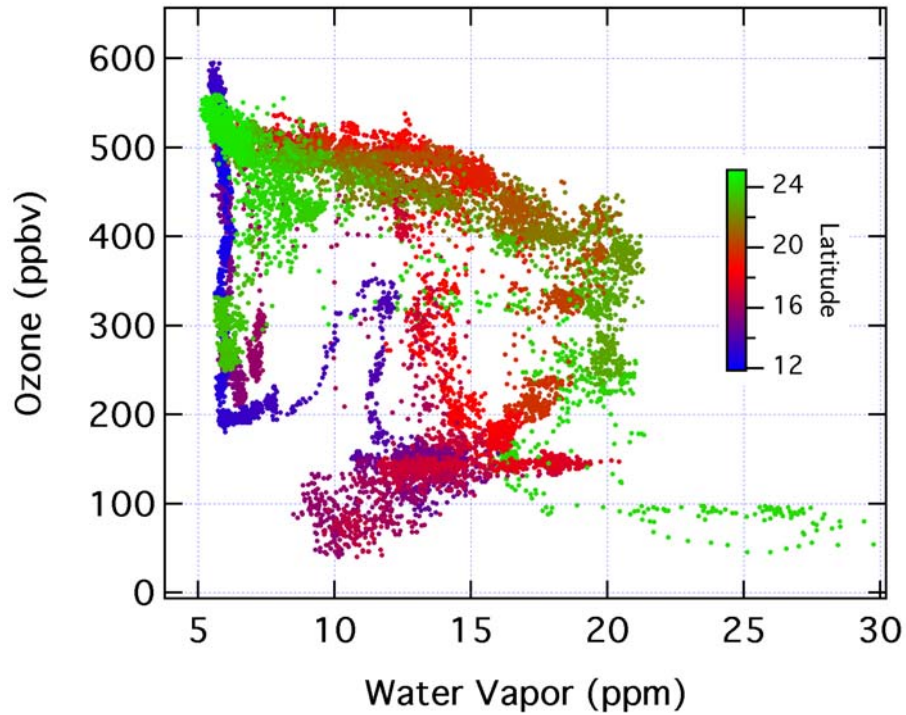
# Ozone Profile July 9, 2002



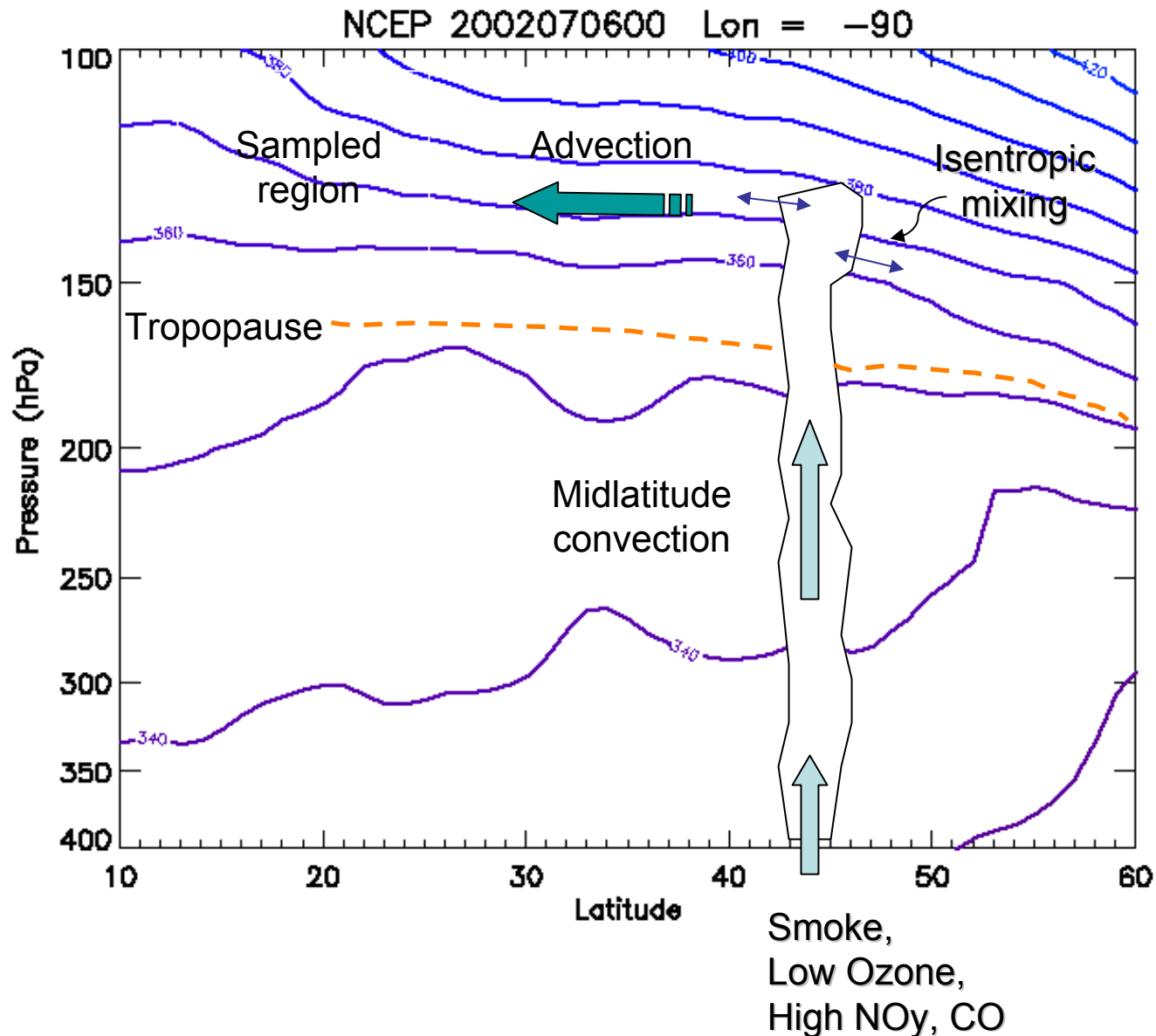
# Schematic of UT/LS in early July



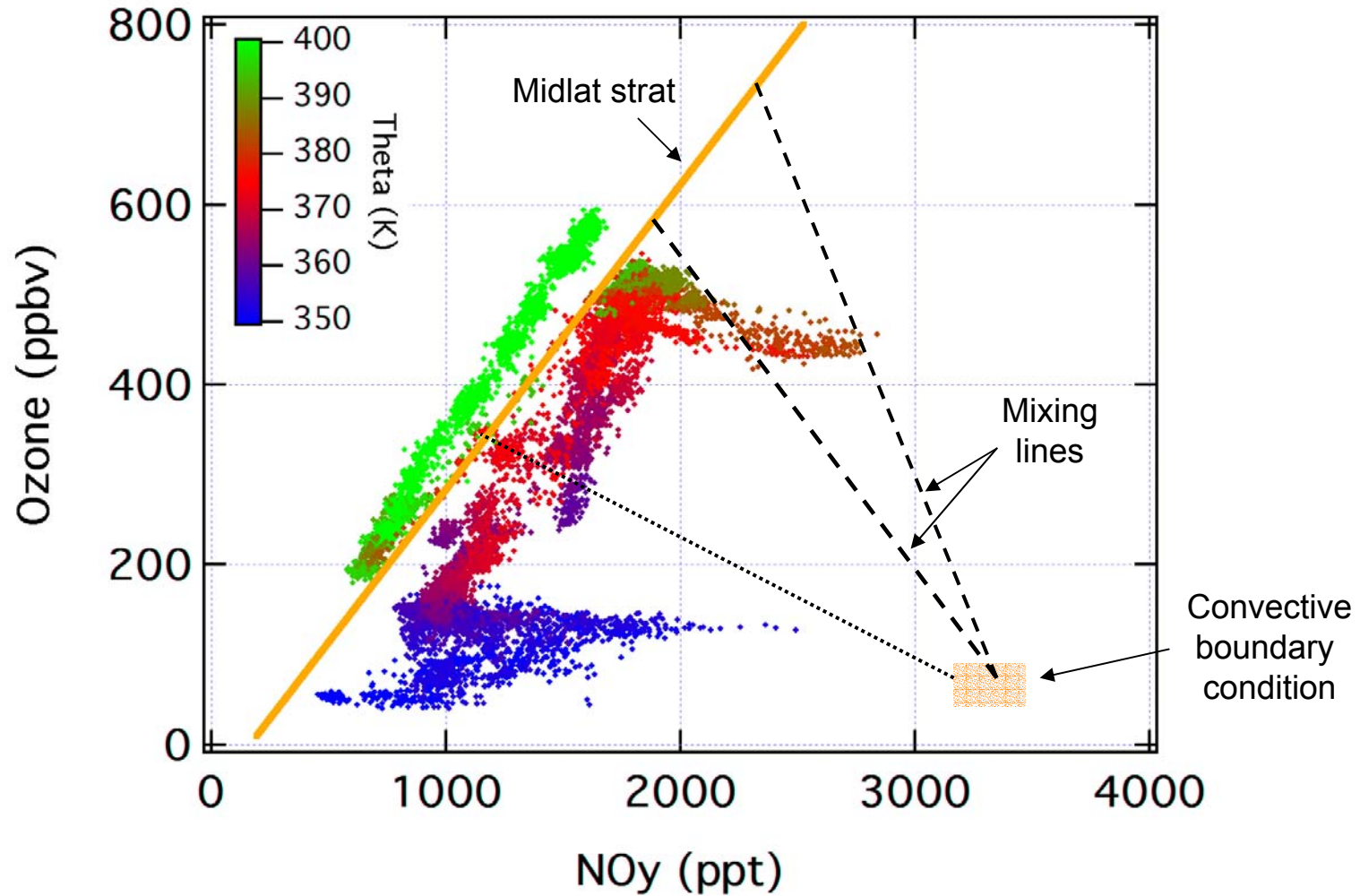
# Ozone Correlations July 9



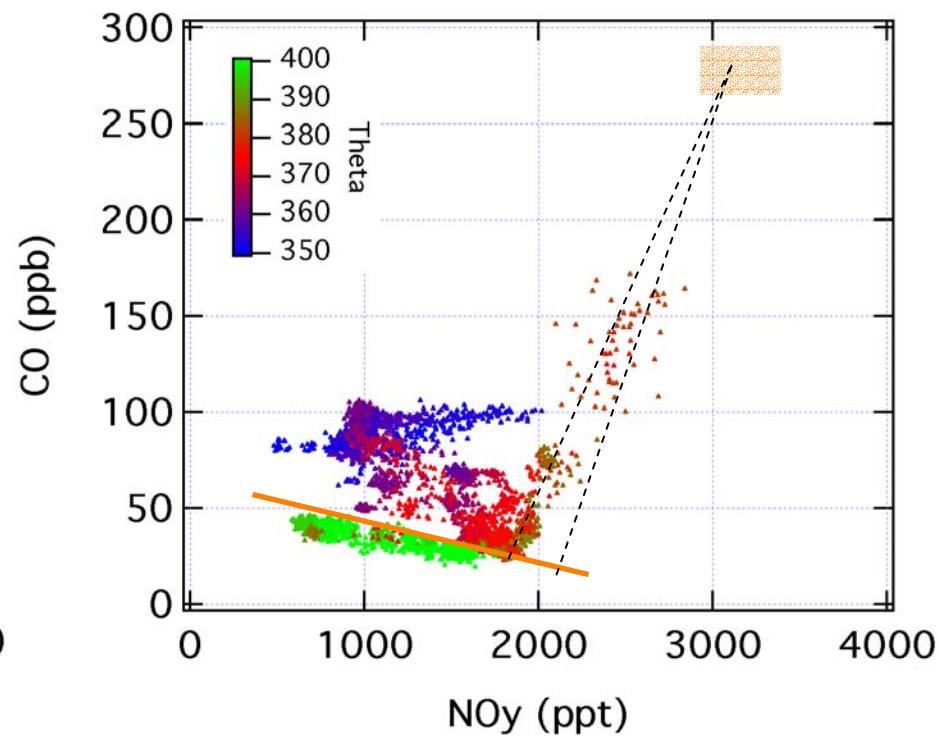
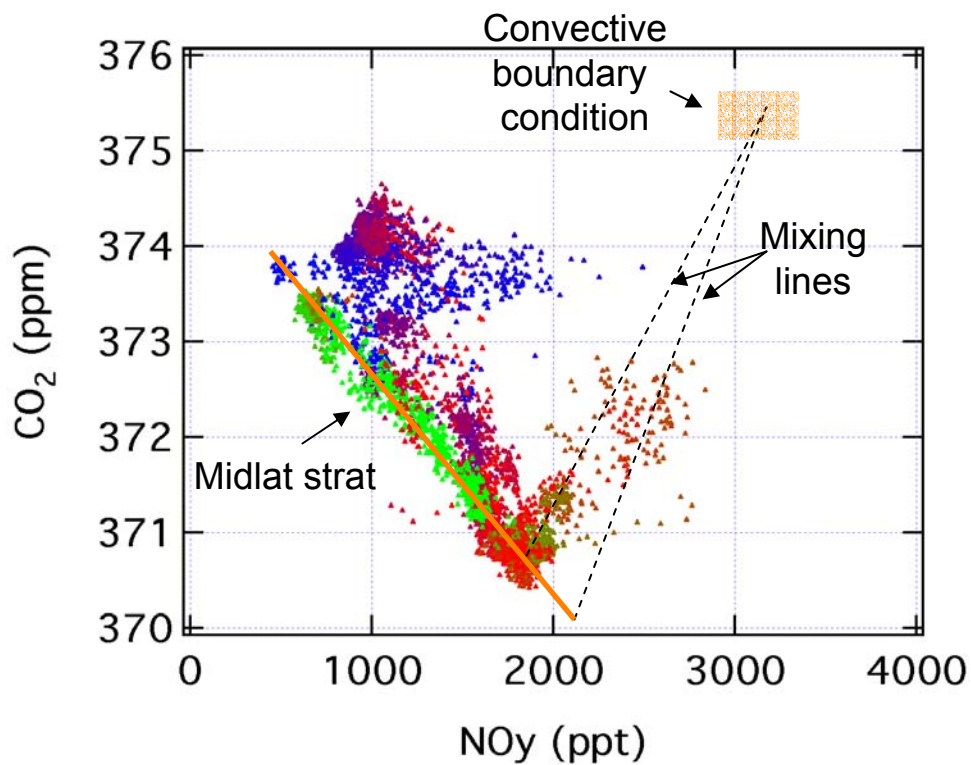
# Schematic of Midlat Convection and Mixing



# Mixing From Ozone vs. NO<sub>y</sub> July 9

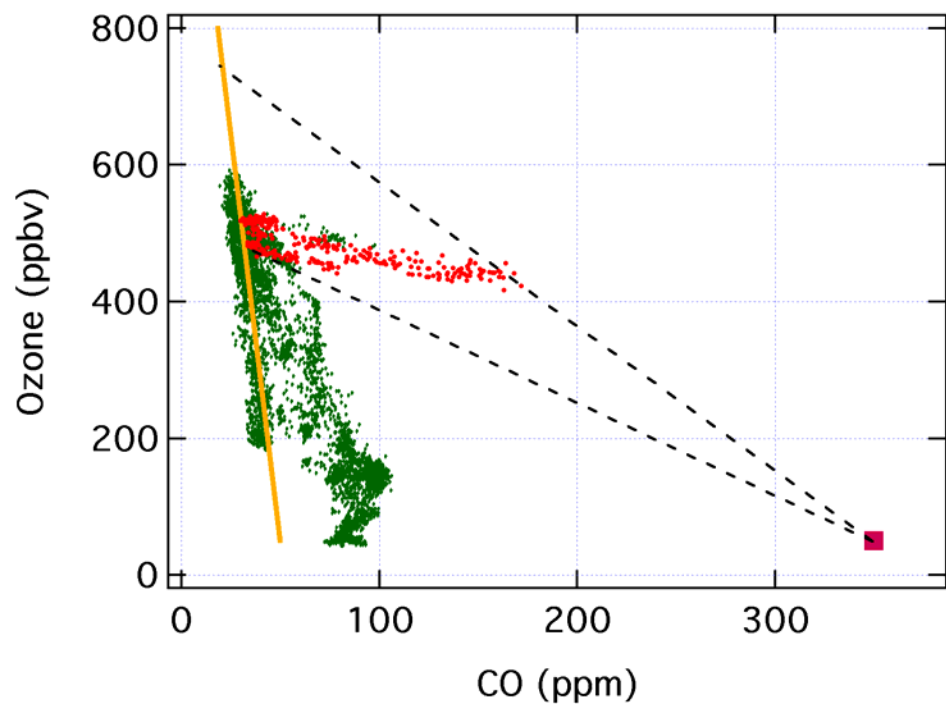
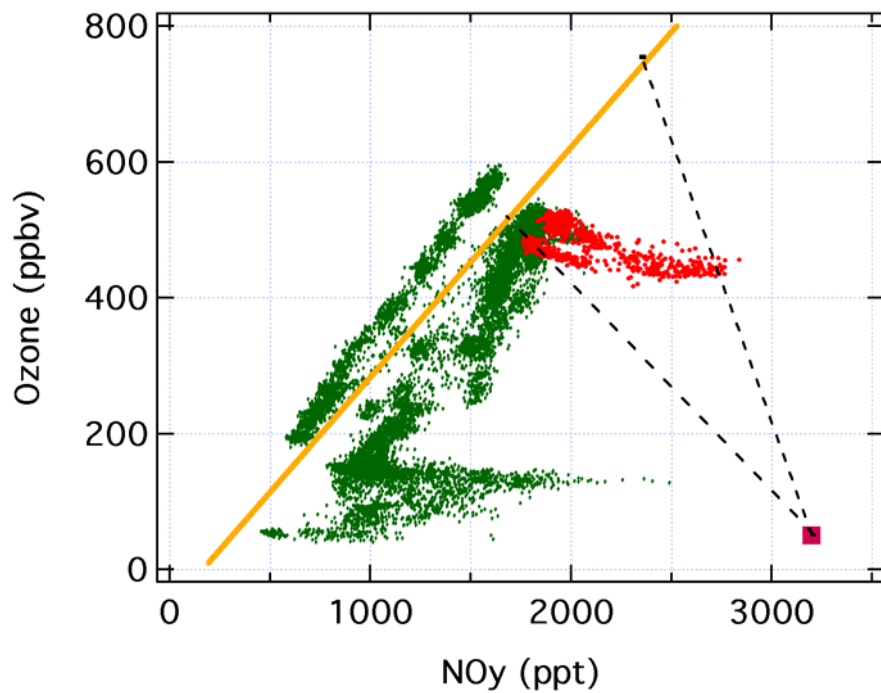


# CO<sub>2</sub> and CO vs. NO<sub>y</sub> July 9

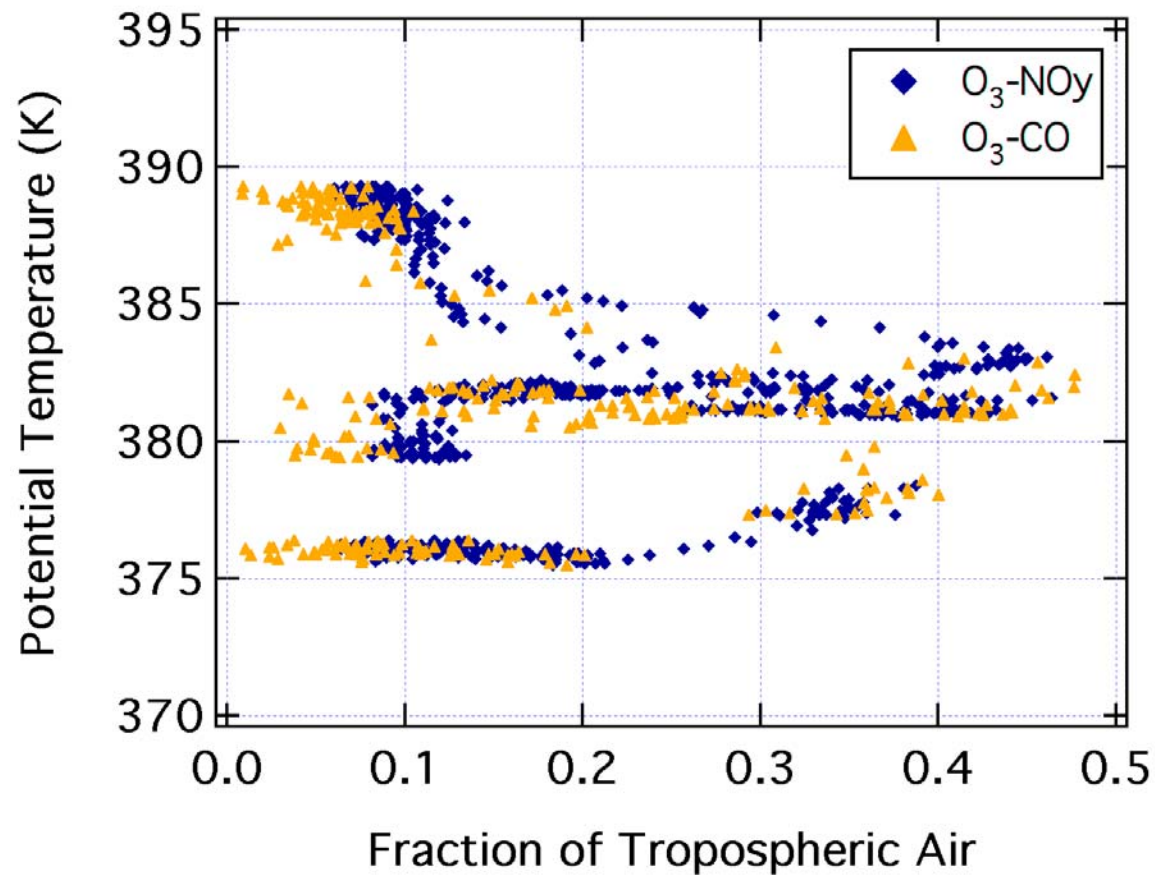


# Plume Mixing From Ozone vs. NOy and CO

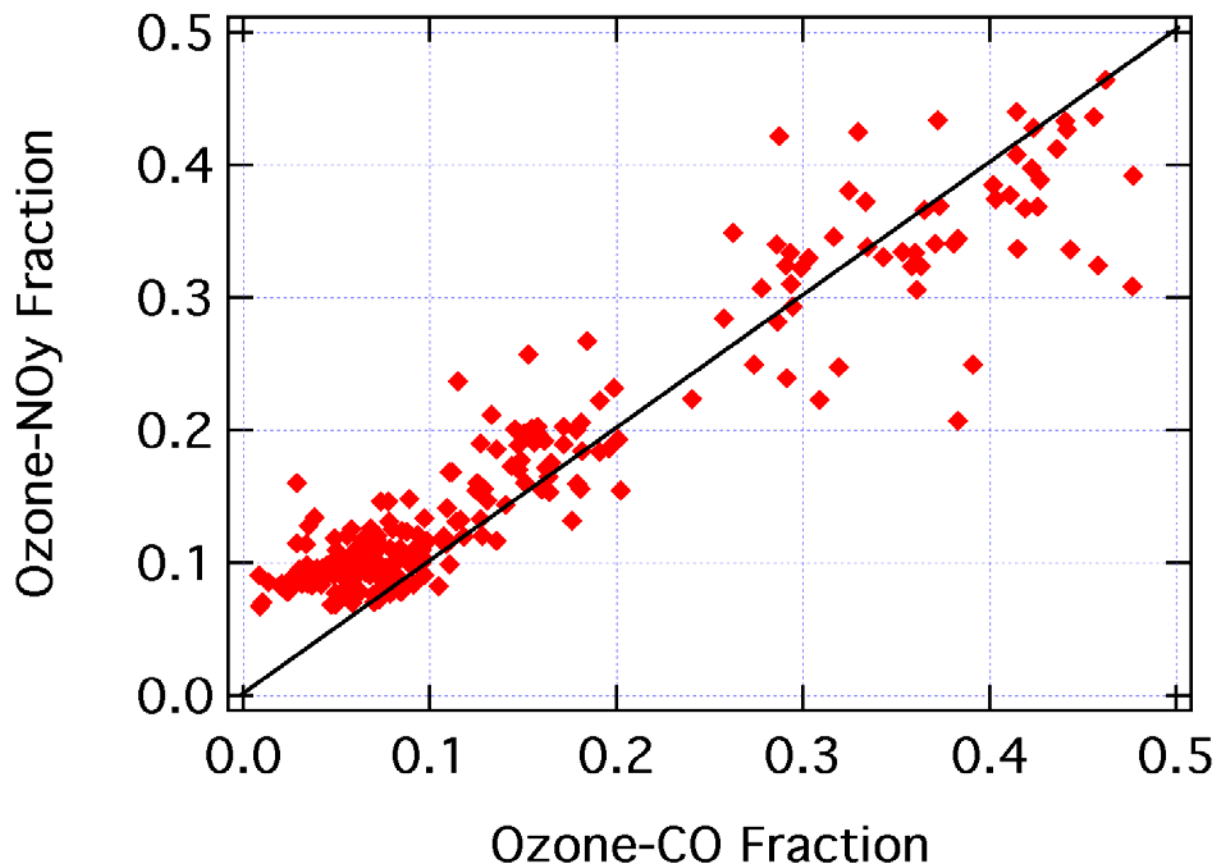
## July 9



# Fractions of Tropospheric Air in the Stratosphere



# Comparison of Mixing Fractions



# Summary

- Large scale UT/LS flow during first two weeks of CRYSTAL-FACE resulted in an extensive “wedge” of midlatitude LS underlying tropical LS in sample region.
- Midlatitude LS wedge contains an interesting mixture of midlatitude troposphere and lowermost stratosphere revealed by a number of measured tracers.
- Considerable fraction of tropospheric air in the midlatitude LS wedge region (up to 40%).

# Future Work

- Further quantify the mixture of tropospheric air in the subtropical lower stratosphere using all of the available long-lived tracers during several early July flights.
- Pin down the convective tropospheric boundary condition by using tropospheric CO<sub>2</sub> estimates and back trajectories.